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August 25, 1989

RECEIVED
AUG 28 1989
REMD SECTION

Mr. Glenn Curtis
U.S. Environmental Protection Agency
Superfund Branch
726 Minnesota Avenue
Kansas City, Missouri 66101

RE: Cherokee County CERCLA Site

Dear Mr. Curtis:

These comments on the "Final Draft Groundwater/Surface Water Operable Unit Feasibility Study Supplement, Galena Subsite, Cherokee County, Kansas, July 1989" (OUFS Supplement) are submitted on behalf of the following potentially responsible parties (PRPs): AMAX Inc., ASARCO, Inc., E.I. DuPont DeNemours & Co., Gold Fields Mining Corporation, N.L. Industries, Inc., St. Joe Minerals Corporation and Sun Company, Inc. These comments on behalf of the above PRPs are not an admission or waiver of any defense (and should not be considered or construed as an admission or waiver) concerning their potential liability with respect to the Cherokee County Site, or concerning the propriety of the U.S. Environmental Protection Agency's (EPA) activities there.

As indicated by the title and discussed in Section 1, the OUFS Supplement is an addition to the original Groundwater/Surface Water OUFS dated February 26, 1988 (1988 OUFS) and is not a stand-alone document. The PRPs provided extensive comments on the 1988 OUFS (letter to Alice C. Fuerst dated April 28, 1988), which, as relevant are incorporated herein by reference. While a number of flaws in the 1988 OUFS that we commented on in our April 28, 1988 letter have been addressed in the OUFS Supplement, other flaws remain and are expanded upon in the OUFS Supplement.

Goals and Objectives

The PRPs are uncertain what the current remedial goals and objectives are for the Groundwater/Surface Water OUFS. The 1988 OUFS defined short-term and long-term goals and objectives for the Groundwater/Surface Water remedial measures. The OUFS Supplement defines a single set of remedial objectives which, with the exception of an additional objective, reflects the short-term goals and objectives included in the 1988 OUFS. We therefore presume that the long-term goals defined in the 1988 OUFS are no longer being considered or have otherwise been subsumed in the OUFS Supplement. If long-term goals are still being considered, then our criticisms set forth in previous comments still stand.

The additional objective added to the previous short-term goals used to evaluate alternatives in the OUFS Supplement is "Protect human health of the population within the subsite from mining-related contaminants in the surface-deposited wastes". As discussed in our April 28, 1988 comment letter and Attachment by Charles A. Menzie & Associates, the PRPs disagree with the EPA's claim that the surface deposited wastes pose any significant risk to human health. Given the lack of a significant health risk, protection of human health from surface-deposited mine wastes is an inappropriate and unnecessary objective.

Future Remediation

In the detailed analysis of alternatives (Chapter 3 of the OUFS Supplement) the EPA has noted for all action alternatives that future remediation may be required if groundwater and surface water metal mass loads are not acceptable following implementation. Yet, the EPA has not defined anywhere in the 1988 OUFS or the OUFS Supplement what will be "acceptable" metal loadings or how they plan to determine metal loadings for purposes of this requirement. The only measures of expected metal loadings reduction included in the 1988 OUFS and OUFS Supplement are based on a very simplistic model which provides a presumed order of magnitude estimate. For example, if the model estimates a 20 persent reduction in a metal loading, the real value could be between 2 and 200 percent. We doubt that monitoring could detect, let along statistically document, reductions on the lower end of this range.

Accordingly, the PRPs believe that this future remediation requirement contained in the OUFS Supplement is inappropriate, arbitrary and capricious and should be deleted from any future consideration, either because of the lack of a health risk and/or the provisions of Section 121(d)(4)(C) and (F) of CERCLA.

Action Levels

On page 1-14 of the OUFS Supplement an action level for lead is established at 1,000 ppm for the Galena Subsite. The PRPs consider this to be an appropriate level of lead as applied to any action to be taken in regard to the mine wastes, recognizing that there may well be naturally occurring levels of lead in soils and rock materials greater than this, the remediation of which is both technically and legally problematical.

On page 1-11 of the OUFS Supplement, EPA has also established a level of concern for zinc of 5,000 ppm. The PRPs believe 5,000 ppm to be much too low, as the 1989 pilot leach tests which PRPs conducted (with EPA oversight) indicated that waste material with concentrations of zinc as high as 14,000 to 15,000 ppm did not produce long-term leachates with zinc contents which were above baseline groundwater concentrations. Such waste materials therefore will not cause additional degradation with respect to zinc.

EPA has also established a level of health concern for cadmium at about 23 ppm and considers this to be a "conservative level of concern." The PRPs asked Charles A. Menzie & Associates to review available information on cadmium and to make a preliminary determination of what might be a safe level. Dr. Menzie's analysis of allowable levels of cadmium is provided as an attachment to this letter. Dr. Menzie calculated (using the reference dose for food as a basis for calculating an equivalent level in soil) that 100 mg/kg (ppm) in soil would be a safe level without even considering absorption factors, exposure rates, the specific bioavailability of cadmium sulfide or other appropriate factors. Further, work that has been done on cadmium relates to cadmium in soil, not in mine waste. Because the waste at issue here is much coarser in particle size than soil, any values determined for soil would be extremely conservative as much less mine waste is likely to be ingested. It is likely that if a full risk assessment were performed, taking into account all the factors appropriate to the Galena Subsite, that an acceptable level of cadmium would be considerably in excess of 100 ppm.

The PRPs have also reviewed a draft document entitled "Public Health Evaluation, ASARCO Inc., Globe Plant Site, Denver, Colorado; a joint study by ASARCO Inc. and the State of Colorado, July 1989"; this document supports cadmium concentrations of 120 ppm in soil. The document states "the major contributor of cadmium to the total daily intake in this sector is from the ingestion of soil and dust. The model projects that when cadmium soil concentrations exceed 120 mg/kg, the daily intake of cadmium will exceed 50 mg/day resulting in an increased risk to the residents in that area" (Appendix A, page xxvii).

The PRPs, therefore, urge that EPA consider a level of at least 100 ppm cadmium as being acceptable for the surficial cover should the preferred alternative be implemented.

The PRPs also wish to note that cadmium determination as a function of zinc content may be subject to considerable error. Analytical data on chat obtained by the PRPs tends to support an average ratio of zinc to cadmium of 220 to 1; however, we note there are variations in this ratio in individual samples. The PRPs therefore urge that specific cadmium determinations be made before any waste material is deemed unsuitable for surficial cover.

CHARLES A. MENZIE & ASSOCIATES

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Ken Paulsen
AMAX Mineral Resources Company
1707 Cole Boulevard
Golden, CO 80401 - 3293

Dear Mr. Paulsen:

This letter is in response to your question concerning "Allowable Levels" of cadmium in mine waste. I have made a conservative calculation of an allowable level based on the possibility that mine waste would be incidentally ingested. As I understand the situation, incidental ingestion of mine waste is viewed as the critical pathway with regard to potential risks and the derivation of allowable cadmium levels.

Based on a set of conservative assumptions, I calculated allowable levels of 50 to 100 ppm for cadmium in soils. If any of the assumptions are examined independently and made more realistic the calculated levels for cadmium would be higher. The basis for these calculations is given below:

Assumption	Comment
10 kg child chronic exposure	this is a small body weight and is conservative for children; use of this body weight (rather than a full adult) yields a higher dose (per unit body weight) than that received by an adult or a large child
soil ingestion at 100 mg/day per day of exposure	this assumption is considered conservative because studies have shown that the median value for soil ingestion by children is typically less than 100 mg/day; it also assumes that the mine waste at the site would be amenable to incidental soil ingestion and that the child spends sufficient amount of time at this one location to ingest a quantity in the amount of 100 mg/day;

daily exposure	it is assumed that the child would visit the site on a daily basis; in fact, visits are likely to be infrequent; for example, if the site is not developed for residential use and is visited only during play activities, it may be more reasonable to assume that the area is visited as much as a few times per week.
100% of the cadmium is bioavailable from the soil	this assumption is very conservative inasmuch as it is expected that a large fraction of the metals (including cadmium) in soils will pass through the digestive system unabsorbed; if the cadmium exists as a relatively insoluble species (e.g., cadmium sulfide), it is even more unlikely that the metal will be absorbed from soil in the digestive system.

Cadmium has the potential for causing systemic health effects when the route of exposure is ingestion. In particular, the effect of greatest concern is kidney toxicity. The USEPA has developed Risk Reference Dose (RfD) values for cadmium depending upon the media in which cadmium is ingested. These values represent long-term daily intake levels that the USEPA generally considers to be thresholds below which no detrimental effects are expected. An exceedence of an RfD value does not mean that the effect is likely to occur but only that the potential exists for the effect of concern.

I have used the USEPA's July 1988 "updated" RfD values for cadmium to "back calculate" an acceptable level of cadmium in soils under the assumption that the soils are the primary source of the cadmium. The USEPA developed two RfD values as follows:

RfD for Cadmium in Water = 0.0005 mg/kg/day

RfD for Cadmium in Food = 0.001 mg/kg/day

Using these values, the allowable level of cadmium in soil can be calculated as follows:

$$\text{Allowable Level of Cd} = \frac{\text{Body Weight (kg)} \times \text{RfD (mg/kg/day)}}{\text{Soil Ingestion Rate (kg/d)} \times \text{Fraction Absorbed}}$$

Using this simple formula and the conservative assumptions stated above, I calculate the following allowable levels of cadmium in soils:

Using the RfD for Water = 50 mg/kg Cd in Soils

Using the RfD for Food = 100 mg/kg Cd in Soils

If we vary any of the exposure assumptions to make them less conservative and more realistic of conditions at the mining area we increase the calculated allowable level of cadmium. For example if any of the following conditions are considered independently they will each result in an increase in the allowable levels by a factor of two (i.e. 100 - 200 mg/kg of cadmium is acceptable for ingestion scenario for soil):

a) children that visit the site are typically larger than those considered here (e.g. , in the range of 20 kg or more);

b) cadmium sulfide has relatively low bioavailability (50% bioavailability may still be conservative);

c) children visit the area only a few times per week rather than daily;

d) children ingest soils in amounts represented by typical median levels (around 50 mg/day).

Based on the above and considering the conservative assumptions made, I conclude that a cadmium level in soils on the order of 50 to 100 mg/kg (ppm) should be protective of human health with regard to incidental ingestion of soils. Higher levels would still be protective if each of the underlying assumptions is examined independently.

If you have any questions, please call.

Sincerely,

Charles A. Menzie

Charles A. Menzie, Ph.D.

AMAX Mineral Resources Company
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303 234-9020

AMAX Minerals + Energy

August 18, 1989 Ref: 1091C/890818

US EPA, Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

VIA FEDERAL EXPRESS

Attn: **Mr. Glenn Curtis**

Re: **FINAL REPORT OF INVESTIGATIONS: PILOT LEACH TESTING**

Dear Mr. Curtis:

Attached please find the Final Report of Investigations, "Pilot Leach Testing - Galena Subsite, Kansas" describing the pilot leach testing program undertaken by Adrian Brown Consultants on behalf of the participating PRP group. The report describes the program, presents the data, and evaluates the likely impact of the Additional Alternative in terms of water quality. The final report addresses the comments provided by EPA Region VII on the draft reports of June 30 and July 27, 1989 and incorporates the final data reports of the project.

The Participating PRPs submitted the draft report on June 30, 1989, as had been agreed with EPA Region VII. This Final Report of Investigations, which has been prepared as a contractor report to the Participating PRPs, completes the deliverables required by the April agreement.

The major technical conclusion of the pilot tests is that, within a few pore volumes of the initiation of flow, the leachate from the flow-through tests returned to steady values typical of starting water and well within the 1989 baseline range of starting waters. Therefore, based on these tests, selective placement of materials in exposed ground water at the Galena Subsite should have no negative effect on long-term water quality. When combined with other aspects of the Additional Alternative, improvement in overall water quality, particularly of the local streams, may be achieved.

There are some matters raised in the Draft Report of Investigation that were removed from the Final ROI in response to EPA comments that they were outside the scope of the actual pilot testing and therefore not suitable for inclusion in a report of those investigations. Nonetheless, the PRPs and our technical consultants consider that these matters are of technical substance and merit in viewing the overall selection of remedy, and we consider that they should be raised in this transmittal letter.

There are four principal matters that we wish to identify:

1. The PRPs consider that the data show the waste materials on the ground surface are not the cause of the low pH and elevated levels of metals and other dissolved solids observed in shallow ground water wells in the Galena area.

   As was pointed out in the Phase I Remedial Investigation (RI) (1) and Spruill (2), despite the geographical correlation of abandoned mines and mineralized ground water, the causal connection between mining wastes and ground water "contamination" is tenuous. In the RI, zinc is the only indicator parameter that could be shown statistically to be elevated in drinking water wells located down gradient of mine workings and wastes; no statistically discernible increase over baseline ranges was observed for cadmium, lead, iron, or net alkalinity (RI, Pages 46 to 49; Figures 4-7 to 4-9). The lack of covariance between zinc and the other indicator species to be expected from the EPA conceptual model of acid generation and metals dissolution suggests that the situation is not as simple as postulated in the RI.

   The new data of this study provide further evidence against a simple causal connection between mining wastes and shallow ground water degradation. All 8 of the ponds that were sampled in this baseline study are surrounded by mining wastes, yet the range of observed water quality, as shown in Table 3.7, is large. Consider the differences in water quality between Pond 41 and the Blue Hole, which are located less than 100 meters apart in Area 4. Pond 41, evidently a subsided shaft based on its form and the characteristics of the surrounding waste materials, has a pH of about 7, conductivity of about 530 umho/cm, low dissolved oxygen, and low to non-detectible values of metals. In contrast, the Blue Hole, also a subsided mining feature, has a pH of about 3.5, conductivity of about 370 umho/cm, relatively high dissolved oxygen (based on laboratory measurements of oxidation-reduction potential (ORP)), and dissolved metals in the tenths of parts per million (Cadmium) to a few parts per million (lead and zinc).

   Furthermore, in the batch and flow-through tests reported as part of this program and in the 1988 laboratory-scale testing, the leaching of waste materials did not generate acidity. In all cases, the pH of the leachate was above 5.5 su. In the 1989 studies reported here, the pH of the solutions rose from as low as 3.5 to as high as 6.5 in some tests. The Final Report documents that this is related to the presence of carbonate minerals in both the waste rock and the chat.

Thus, the test leaching data are not consistent with the hypothesis of acid mine drainage (AMD) developed by natural leaching of these materials, either on the surface or if moved to flooded subsidence features. Similarly, long-term leaching (as simulated in the flow-through tests) produces dissolved metals concentrations that are indiscernible (in the formal, statistical sense) from the concentrations in the starting waters.

Rather than hypothesize a causal connection between mining wastes (or even mining activity) and degradation of shallow ground water quality (if any such degradation exists), the evidence can be formulated better in terms of a common-cause connection (e.g., Reichenbach (3)). In the common-cause formulation, mining and mining waste, on the one hand, and ground water with elevated levels of metals, on the other hand, are each causally related to the presence of mineralized ground. Evaluation of ambient data, geochemical modeling, and evaluation of baseline water quality around other, recently discovered (but undeveloped) Pb-Zn deposits such as Red Dog in Alaska have been presented by Angino (4). The Angino report shows that there are compelling geochemical reasons to believe that ground water recharging to and flowing through the mineralized and fractured ground of the Galena ore field (even without mining) would produce, at least locally, acid waters and elevated levels of sulfate, total dissolved solids and dissolved metals. In light of this information, the effects of natural mineralization of the area (including fracturing, brecciation, and silicification, as well as sulfide mineralization) are the common cause of the mining/mining waste and the observed water quality.

2. The 1989 pilot program tested the likely effect of the leachate on shallow ground water. When the decision criterion is water quality of the shallow aquifer due to the placement of waste materials in the saturated zone, the conclusion of the pilot testing is that long-term, post-emplacment water quality is expected to be the same as the current water quality, though years of effort and millions of dollars in cost (based on the 1989 OUFS Supplement) will have been expended to move the waste materials.

   Based on the lack of discernible difference in projected water quality, the current test data are equally compatible with a no-action alternative for surface waste materials in terms of likely impact on shallow water quality. As discussed above and extensively in the Final Report of Investigations, other aspects of the Additional Alternative (particularly remediation of current stream capture) may provide for overall improvement in water quality, but these aspects were not tested directly by the ABC pilot testing program. The principal reduction in solute loadings derived by the analysis of Appendix E of the 1989 OUFS Supplement comes from the rechannelization of surface water drainage that is currently captured by subsidence features. As has been shown elsewhere in the Tri-State district, stream capture can be addressed by simple remedial measures that do not require use or handling of significant volumes of surficial material. Based on the analysis done by EPA, the remediation of the surficial drainage would accomplish all that the much more elaborate subsurface disposal proposes to accomplish relative to water quality, given the results of the 1988 and 1989 leach testing programs.

3. If some form of the Additional Alternative is selected, materials handling of the waste rocks may be important to detailed planning for a cost-effective remedial action. In particular, screening of waste rock should be examined in terms of the data provided by the ABC batch testing results (Section 3.2 of the final report) to determine the benefits of this step to overall projected performance. The batch tests of the 1989 pilot testing program indicate that mass loadings of metals using unscreened waste rock likely would provide for no long-term degradation of water quality in the shallow aquifer. Based on the data of Tables 3.9 and 3.10 and Figure 3.1 of the Final Report, the PRPs consider that:

   a) The apparent elevation in leachable metals from using unscreened waste rock and chat is small. Compare the results of Batch Test 1 (2:1 water/rock ratio with water 524/ plus 2-inch screened siliceous waste rock and chat) with Batch Test 3 (2:1 water rock ratio with water 524/ unscreened siliceous waste rock and chat). In the unscreened test, the net change in concentration of lead (post leaching concentration compared to pre-leaching concentration; Table 3.10) is greater by 0.26 mg/l and cadmium is greater by only .03 mg/l. The changes in zinc and sulfate concentrations are actually lower (by 2.2 and 60 mg/l, respectively) in the case on the unscreened waste rock than in the case of the screened waste rock.

   b) The resultant batch leachate concentrations fall within the 1989 baseline range; compare Table 3.9 with Table 3.8.

c) The flow-through tests show that the long-term water quality is not a function of the total metal content of the rock or even of the short-term leachability of the rock-chat mixtures, but rather is related to the chemistry of the influent water.

In these circumstances, we consider that that benefit of the screening step in terms of long-term water quality has not been demonstrated.

Similarly, we consider that the field scale implementation of the Additional Alternative should strive to minimize all materials handling steps in order to minimize the potential for abrasion between waste materials. We appreciate that some degree of mixing and rock-to-rock movement is inevitable and also that testing has shown the materials to be extremely hard. Nonetheless, our experience with materials handling - like that of our consultants - is that abrasion (and hence the formation of fresh faces that may be more leachable) increases as materials handling increases. Thus, any steps that minimize materials handling will likely minimize the short-term water-quality impacts observed in the 1989 pilot leaching program. The minimum impact on short-term leachability would occur from taking a no-action approach to surface wastes, using other approaches to diverting current surface-water capture as the mechanism for improving long-term water quality.

4. Based on the results of the testing programs and our understanding of the Additional Alternative, the PRPs consider that even if the full scope of the Additional Alternative were invoked, there would be no need for special handling of materials that would be moved to subsidence features above the water table or to exposed ground water in major subsidence features that have pH above about 5.5 water under current conditions, as the EPA concern is related to leaching of fine-grained materials in acidic waters. That is, moving waste materials to dry holes or to ponds such as ponds 41 (pH = 7.1); 617 and 720 (pH = 6.9), and even ponds such as 14 (pH = 6.1) does not require either screening or geochemical characterization and segregation.

I trust that you will find this letter and the Final Report of Investigations acceptable and will incorporate their data, analyses and conclusions into the adminisitrative record of EPA decision making for the Galena Subsite. If you have questions about this letter or the Final Report of Investigations, please contact Mr. Kenneth Paulsen of AMAX Mineral Resources, who will field comments and questions on behalf of the Participating PRPs.

Nothing in this letter or the Final Report of Investiagtion by Adrian Brown Consultants may be considered an admission or waiver of any defense by any or all of the PRPs concerning liability for response costs or concerning the propriety of U.S. Environmental Protection Agency's actions at the Cherokee County site as a whole or the Galena subsite in particular.

Sincerely,

Kennth R. Paulsen

On Behalf of:

AMAX Inc.
ASARCO
E.I. DuPont de Nemours & Co.
Gold Fields Mining Corporation
NL Industries
Sun Comapny

References:

(1) EPA, 1986. Final Draft, Phase I Remedial Investigation Report - Cherokee County, Galena Subsite. EPA Document No. 127.7LB9.0, April 23, 1986.

(2) Spruill, T.B., 1984. Assessment of Water Resources inLead-Zinc Mined Areas in Cherokee County, Kansas, and Adjacent Areas: U.S. geological Survey Open-File Report 84-439

(3) Reichenbach, Hans, 1956. The Direction of Time. Berkeley, University of California Press.

(4) Angino, E.E., 1984. Premining Surface and Shallow Ground WaterQuality in the Viciniy of Short Creek, Galena Kansas. Report to Environmental Managment Services Co., Fort Collins, Colorado. Submitted to EPA by AMAX Mineral Resources for certain PRPs by letter from P. Keppler (AMAX) to A. Fuerst (EPA/VII, dated March 22, 1988

cc: K. Paulsen; P. Keppler (AMAX)
J. Richardson (ASARCO)
S. Wilson (DuPont)
G. Upphof (EMS)
A. Godduhn (Gold Fields American)
B. Sams (NL)
M. Bernstein (Skadden Arps)
L. Grossi-Tyson (Sun)

On page 1-11 of the OUFS Supplement, EPA has also established a level of concern for zinc of 5,000 ppm. The PRPs believe 5,000 ppm to be much too low, as the 1989 pilot leach tests which PRPs conducted (with EPA oversight) indicated that waste material with concentrations of zinc as high as 14,000 to 15,000 ppm did not produce long-term leachates with zinc contents which were above baseline groundwater concentrations. Such waste materials therefore will not cause additional degradation with respect to zinc.

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The PRPs, therefore, urge that EPA consider a level of at least 100 ppm cadmium as being acceptable for the surficial cover should the preferred alternative be implemented.

The PRPs also wish to note that cadmium determination as a function of zinc content may be subject to considerable error. Analytical data on chat obtained by the PRPs tends to support an average ratio of zinc to cadmium of 220 to 1; however, we note there are variations in this ratio in individual samples. The PRPs therefore urge that specific cadmium determinations be made before any waste material is deemed unsuitable for surficial cover.

Revegetation

The PRPs are uncertain of the revegetation requirements proposed and the remdial benefits that may result from revegetation. The OUFS Supplement includes revegetation of up to 710 acres of disturbed area as part of each action alternative. However, no details are provided on the specific measures planned to bring about revegetation or why revegetation is needed to meet remedial objectives. Several references are made in the OUFS Supplement to lead us to believe that only limited revegetation measures are planned; including EPA's estimate that the revegetation can be conducted for about $1,000 per acre, including topsoil addition, soil amendments, and reseeding. We understand that there are ongoing pilot revegetation studies that will provide additional information on specific revegetation measures which may be used, but we believe the EPA should at least define the planned objectives of their proposed limited revegetation and provide the basis for their revegetation cost estimate. Only on that basis can the PRPs effectively comment on the revegetation aspect of the document.

No consideration is given in the OUFS Supplement to the remedial benefits that may result from revegetation. With the exception of possibly a small reduction in erosion, it is believed that the proposed revegetation will have little or no effect on metal loadings or other remedial objectives. The primary objective of the surface components of all remedial alternatives is to reduce infiltration into the shallow groundwater system by increasing runoff. This is typically achieved by reshaping and contouring, not by revegetation. Since vegetation can increase infiltration and any evapotranspiration from the planned limited revegetation would likely be inconsequential, any effect that revegetation may have on the overall remedial objectives may be negative. Further, the wastes are not considered to be highly erosive and any required stabilization could be accomplished more cost-effectively by methods other than revegetation (e.g. contouring).

Accordingly, the PRPs view any likely positive affects of the proposed revegetation to be largely aesthetic in nature and outside the realm of CERCLA.

Deep Well Remediation

While the PRPs understand the objective of and purpose for the proper construction of wells that penetrate to the regional deep aquifer (the Roubidoux), they do not believe that it is appropriate to use CERCLA funds to rehabilitate improperly constructed wells or municipal wells that have reached or exceeded their normal functional life. Page 3-6 of the OUFS Supplement indicates that there are four wells requiring remdiation, but no information is provided on the specific reasons for action. The PRPs suggest that the EPA provide specific details on each of the wells determined to need remediation and justify that portion of the capital costs for this action that can be directly attributed to past mining activities.

Preferred Remedy

In previous comments to EPA the PRPs have strongly urged the adoption of the no-action alternative. The PRPs believe that the recent test work carried out by them (see Results and Anlysis of Leaching Tests, Adrian Brown Consultants, Inc., December 5, 1988; and Pilot Leach Testing, Galena Subsite, Kansas, Adrian Brown Consultants, Inc., August 1989) continues to fully support the no-action alternative. Notwithstanding our previous comments, however, if EPA moves forward with the current preferred remedy (Alternative 5 in the OUFS Supplement), we offer the following comments on that preferred remedy.

Although the PRPs believe that the current preferred remedy is clearly superior to the preferred remedy identified in conjunction with the 1988 OUFS (Alternative 2 in the OUFS Supplement), they disagree with the EPA's approach to subsurface disposal of surface mine wastes. The EPA's current preferred remedy calls for the finer sized fraction of the waste rock and the chat with higher zinc values to be selectively disposed of below grade in the unsaturated zone. Waste rock greater than 2 inches in size and low zinc chat would be placed in the saturated zone. This approach was developed by EPA's contractor, CH_2M Hill, based on data indicating that the highest concentration of certain metals occur in the smaller fractions, and the results of jar leach tests which indicated that under certain conditions these fractions could release relatively high concentrations of metals under saturated conditions.

The results of testing conducted by the PRP's technical contractor, Adrian Brown Consultants, Inc. (ABC), based on a work plan developed by EPA using column leaching of waste rock and chat under both fully and variably saturated conditions, indicated that the leaching of metals was significantly lower under saturated conditions than under variably saturated conditions. Subsequent testing conducted in 1989 by ABC (with EPA oversight) indicated that experimental concentrations of metals leached under saturated conditions would not degrade existing water quality. Accordingly, the PRPs believe that it really doesn't matter whether the wastes are disposed of below grade under either saturated or unsaturated conditions. ABC's report on the pilot leach testing dated August 1989 states on page 4-7 "because the incremental source-term metals are low to indiscernible (in the range of plus or minus 20% or less of the influent chemistry and within the 1989 range of baseline water quality by cycle 2 of the flow-through testing) in the long-term pilot-scale leaching, disposal below the water table will not increase the concentration in solution of the three indicator metals beyond the 1989 baseline range of the shallow aquifer all else being equal".

Further, the investigations conducted by ABC demonstrate that, other things being equal, the rate of leaching is increased with increasing surface area and exposure of fresh (non-weathered) mineral surfaces. Accordingly, to minimize the release of metals, material handling - which will fragment the rock thereby increasing both surface area and fresh surface exposure - should be minimized to the extent possible. Therefore, the PRPs are opposed to those aspects of EPA's preferred remedy which require considerable material handling. From an overall metals loading standpoint, the disposal should be done on a nonselective basis to mimimize materials handling.

Although the PRPs believe that nonselective placement of waste materials is the best way to proceed, even if EPA determines that some selective placement is required for saturated disposal, it would not be logical to apply such selective placement to dry mine voids or water filled voids where the pH is above 5.5.

Support of the PRP's views toward subsurface disposal is provided by the metal mass load modeling contained in the OUFS Supplement. The estimated mass load reductions for the EPA's preferred remedy for the three parameters modeled are summarized in the attached Table 1. These modeling results clearly demonstrate that implementation of the EPA's preferred remedy will result in a less than 30 percent total reduction in metal loadings, with the vast majority of this reduction predicted to result from the channelization component. All other components of this remedial alternative -- including the selective subsurface disposal of surface mine wastes -- are estimated by EPA to provide only an additional 5.2 and 2.0 percent reduction in zinc and cadmium loadings, respectively.

On a capital cost basis, the vast majority of the metal reductions can be accomplished with only channelization at an estimated cost of $766,000 - or approximately $32,000 per percent of reduction - with the additional small incremental reduction associated with the subsurface disposal of wastes and other components estimated to cost approximately $7.5 million or over $2 million per percent of reduction.

Given the very small reductions in metal loadings estimated to result from the selective subsurface disposal of wastes, the question as to whether this disposal practice is more effective or even as effective as nonselective saturated subsurface disposal, and the cost ineffectiveness of all components of this alternative other than channelization, the PRPs believe that EPA should re-evaluate its approach to mixing, screening, and placement of mine waste materials.

If the surface wastes pose a significant human health risk from direct exposure - a conclusion which the PRPs believe is not justified - then the PRPs agree that subsurface disposal with a cover of chat with metals below reasonable levels of concern would reduce this risk.

Summary and Conclusion

The PRPs believe that because of the natural geologic conditions occurring in the highly mineralized area of the Galena Subsite it is technically impracticable to develop any effective remedial action that would alter existing conditions in any measurable way. When natural geologic conditions are considered along with the lack of any demonstrated health risks from the mine wastes, the legal basis for remedial action is questionable. Therefore, the no-action alternative is the appropriate alternative. Notwithstanding this position, if EPA proceeds with implementation of the preferred remedy, the PRPs believe that the most cost-effective approach should be utilized; placement of material into the nearest mine void without regard to considerations of size, type or mineral content, except possibly for the surface cover which should have a metal content below 1,000 ppm lead and 100 ppm cadmium. The PRPs also believe that revegetation will not give any additional protection to human health or the environment and will be cosmetic only, so that any planned revegetation program should be minimal.

Many of the PRP's comments and concerns are reinforced by the letter dated August 18, 1989 transmitting to EPA the ABC report on Pilot Leach Testing at the Galena Subsite. A copy of this letter is attached and incorporated herein by reference.

Thank you for your consideration of these comments and for including them in the administrative record.

Sincerely,

ENVIRONMENTAL MANAGEMENT SERVICES COMPANY

Gary D. Uphoff

Gary D. Uphoff
Principal - On Behalf Of:

AMAX Inc., ASARCO, Inc., E.I. DuPont De Nemours & Co., Gold Fields Mining Corporation, N.L. Industries, Inc., St. Joe Minerals Corporation, Sun Company, Inc.

GDU:sam
Attachments
cc: K. Paulson and Peter Keppler (AMAX)
J. Richardson (ASARCO), S. Wilson (DuPont)
A. Godduhn (Gold Fields), B. Sams (N.L. Industries),
C. Mattsson (St. Joe Minerals),
L. Grossi-Tyson (Sun Company)

Table 1
Summary of Estimated Mass Load Reductions
for the EPA's Preferred Remedy
(Alternative 5)

	Total Est. Reduction	Reductions Due to Channelization		Reductions Due to Other Actions	
	%	%	% of Total	%	% of Total
Sulfate	18.4	13.7	74.5	4.7	25.5
Zinc	29.5	24.3	82.4	5.2	17.6
Cadmium	25.6	23.6	92.2	2.0	7.8